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ABSTRACT

Gender, race, and socioeconomic status are important factors in the experience students have with computers before they reach college classrooms, and these experiences establish the foundation for student and faculty attitudes toward computers. English teachers' attitudes toward computers can be considered in the context of the thinking process model analogous to the writing process: the degree to which teachers' attitudes have resulted from prethinking rather than rethinking of facts, fears, and intuitions reflects humanities writers' and teachers' ambivalent relationships with technology. Historically, computer assisted instruction in writing has ranged from early single-activity drill-and-practice software to the notion of "idea processors." There are now numerous applications for computer assisted instruction in literature: tutorials, word processing activities, data base courseware, creative writing software, and interactive fiction. Attitudes toward this changing technology need to be reexamined. Teachers' prethinking, thinking, and rethinking will be a major force in making the most of current technology and students' preconceptions. (HOD)

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Computers in Thinking, Writing, and Literature

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Why not begin with computers and sex?

And I'll introduce that topic by noting that a colleague of mine is convinced that he has found a solution to the problem of promiscuous teenage sex. He wants to require sex education in the schools, as early as possible. After all, he reasons, requiring English and math has turned millions of kids off from those subjects. Why not use the same approach to get kids to avoid....Well, you get the picture.

My colleague's logic may not have quite the rigor we'd prefer in such a problematic area. Still, and it's really the reason I'm mentioning it, the problem he describes with English and math education is directly related to questions of computer-assisted instruction (CAI). As the schools and society at large put more pressure on students to become computer literate -- and especially where computer-using courses are a required part of the curriculum -- we're in danger of vastly increasing the number of computer phobics in this country, just as we've engendered math anxiety and blank page anxiety. There is ample anecdotal evidence that poor -- or just narrowly defined -- CAI is already confirming some teachers' and students' worst fears about the technology, the people involved in it, and their own capacity to understand it.[1]

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Let me re-focus on computers and sex (by which, of course, I mean gender-related issues). Hugh Mehan, at the University of California, San Diego, has reported the following:[2]

> Males and females...have differential access to computers, especially in secondary schools. In elementary schools that have ...central computer labls, boys and girls have equal access. However, this equality is not duplicated during voluntary times on computers (recess, lunch, after school clubs). More boys than girls use computers in their spare time. The equality of access reported in elementary schools disappears in secondary schools. When students ar divided into curricular tracks, a stratification of males and females becomes apparent. Males gain greated access to computer...labs than females.

And while he's at it, Mehan also notes that:

> Ethnic minority and low income students receive a different kind of instruction on computers than their middle income and ethnic majority contemporaries. While middle income students, especially those who are in advanced programs (e.g., Gifted and Talented Education) receive instruction which encourages learner initiative (programming and problem solving), low income and ethnic minority students receive instruction which maintains the control of learning within the program (computer aided drill and practice).

Glen Fisher, currently at the Lawrence Hall of Science at the University of California, Berkeley, has outlined several specific and interrelated causes for gender-bias in CAI, particulary at pre-college levels. To sketch out his concerns:[3]

- There is inherent gender-bias in software, particularly insofar as

educational software has adopted the competitive-aggressive dimensions of arcade games.

- Social stereotypes still identify computers as tools and toys for men and boys.

- Peer pressure and boys' behavior in classrooms still result in boys' being more dominant and intrusive when students are grouped around a computer.

- The content and structure of programming as an introduction to computers still emphasizes math and science examples, exacerbating the gender bias that already exists in those curricular areas.

In light of these trends, it is of some relevance to note that, while in 1981 only one state mandated computer literacy programs in its public schools, by 1985 eighteen states had laws requiring such efforts.[4]

An extended discussion of the issues that Mehan and Fisher have addressed isn't possible here. Suffice it to say that gender, race, and socio-economic status are important factors in the experience students have with computers before they reach college classrooms, and these experiences establish the foundation of what students (and faculty) think computers are for and who they think computers are for.

And speaking of thinking, this is as good a time as any to discuss briefly the thinking process itself, before we use it to focus on computer-assisted thinking and writing.[5]

A Deeply Superficial Model For "Thinking"

Let's play with the notion of a "thinking process" that is analogous to "the composing process." That is, let's propose a working model consisting

of **prethinking, thinking, and rethinking**. And before we elaborate, let's remind ourselves that these represent recursive stages, not a simple linear progression.

Prethinking includes making the implicit explicit. On a given topic, we generate, record, and note prejudices (ours and others'). We articulate facts, memories, feelings, values, speculations, etc., that we are already in possession of. We might also engage in research to acquire more of this raw material for the thinking process.

The **Thinking** stage might then consist of the application of heuristic procedures that use what we've acquired in the prethinking stage. One example would be the activity that Paul Repps describes in Square Sun, Square Moon. Children, trying to understand the nature of their disagreements, are each invited to take four perspectives: (1) How are you right and how is the other person wrong? (2) How are you wrong and how is the other person right? (3) How are you both wrong? (4) How are you both right?

The **Rethinking** stage consists of attaching the prefix "re-" to just about any apposite word: reconsider, reformulate, reaffirm, etc. It is in this stage that students can feel free to change their minds -- if they think they should -- and to articulate those changes.

As in the case of the composing process, some students confuse prethinking with thinking; they mistake affirming and confirming their prejudices with examining them. Others engage in compulsive rethinking. This often leads to thinker's block and is especially troublesome when a paper is due (or when you're trying to decide if now is precisely the best time to buy your first computer).

We can only begin here to explore the utility and limitations of this

model of the thinking process. As with the composing process schema, its main virtue is perhaps that it helps us think about thinking and -- if not more importantly at least more practically --such a framework helps us generate and structure classroom activities that focus on the process, not solely on the product, of students' thinking.

I think.

In any event, this thinking process model will help us examine some of the history, state-of-the-art, and future of computer-assisted composition and literature instruction

Thinking Blocks

A process-model like the one described above suggests that thinking can become blocked at various stages and for a variety of reasons. For example, attitudes toward the computer and its utility in English classes are undoubtedly affected by some of the factors outlined at the start of this discussion.

Let's turn our attention, then, to the world of technology and consider the following:[6]

A THINKING BLOCK

The New York Times reports the development of a special cathode ray tube, called "television."

The article questions the commercial viability of such a product.

(April 8, 1927)

In this case, there was perhaps an understandable stopping of the thinking process at the prethinking stage. The new technology was seen as a curiosity. There were few referents to use in assessing its potential. Without a great many television sets or transmission networks (and with no Super Bowl), it would have been the rare account executive who would have suggested charging one million dollars for one minute of commercial time (late in the game).

This, then, is a classic, garden-variety thinking block, caused in part by lack of impetus for thinking or rethinking.

Let's bring our attention a little closer to home and note some thinking blocks about technology and literacy.[7]

A SERIES OF THINKING BLOCKS IN REVERSE TECHNOLOGICAL ORDER

The following technologies have been thought by English teachers to lead to the decline of literacy:

- **the computer**
- **television**
- **movies**
- **radio**
- **the typewriter**
- **the ballpoint pen**

In these cases, there were (or are) a variety of factors affecting the prethinking and rethinking stages. It remains to be seen (and will be discussed later) exactly how and to what extent some of these advances will, in fact, affect students' literacy. What is more germane here is merely to consider English teachers' attitudes in the context of the thinking process model. The degree to which the teachers' attitudes have resulted from prethinking rather than rethinking of facts, fears, and intuitions reflects the somewhat ambivalent relationships which writers and teachers in the humanities have had with regard to technology. We'll return to this theme in a subsequent section on computers and literature. At this point, we'll focus on some prethinking frameworks for computers and writing per se.

Generations of Computer-Assisted Instruction in Writing

Historically, the development of CAI/writing has ranged from early single-activity drill-and-practice software, to the notion of "idea processors." This progression can usefully be described in terms of "generations."[8]

The First Generation: Drill and Practice. These kinds of programs focused on basic skills such as spelling, punctuation, or sentence-combining. Well-designed drill-and-practice software provides instruction that takes advantage of the computer's capacity for presenting information in a compelling and interactive way while keeping track of the students' progress in order to provide activities which appropriately challenge the students' abilities in needed areas.

Although first generation CAI/writing will undoubtedly continue to improve its capacity for instructing and refining students' basic skills, it is with the introduction of second generation software that the computer begins to have a more profound effect on writing.

The Second Generation: Writer Aids. This term refers to software that focuses on one or the other stage of the basic composing process model: prewriting, writing, or rewriting. (An expanded model would include the obtaining of reader responses, and publication).

Prewriting software, in general, presents the student with a coherent set of questions modeled on those a teacher might use to elicit the student's own ideas on a topic. The computer-student interaction produces a "dialogue," providing the student with raw material for working into a first draft.

Word processors themselves represent writer aids for the writing

stage of the composing process. While not initially designed to teach the student anything about writing, word processors -- as a new medium -- have communicated subtle but profound messages about writing. Students begin to see that their words are no longer "carved in stone" but are written in light. Seeing their words blink, slide, ripple, disappear, and reappear, seems to reinforce the sense that their words are more fluid and easily changed, less of a barrier between having a thought, expressing it, and re-expressing it.

A third kind of writing aid is applicable in the rewriting stage. Style and spelling checkers are common examples. More sophisticated revision software provides direct instruction in rethinking early drafts.

It should be remembered that second-generation software generally focuses on a single stage of the composing process. The available prewriting aids have virtually no word processing capabilities. Word processors may help you search-and-replace, but they won't help you figure out what to put there in the first place. Second-generation style checkers do not provide help in prewriting or word processing.

The Third Generation: Author Systems. These programs generally provide direct instruction for prewriting, provide a word processor, and have editing and rewriting aids. They have evolved partly on the basis of the expertise developed by people who pioneered the second-generation systems.

The Fourth Generation: Idea Processors. In certain respects, these kinds of programs could be considered as another kind of second-generation prewriting or rewriting aid. Historically, however, they came somewhat later and have a qualitatively different nature (that is, the ones that have more going for them than well-written advertising). As

the category name suggests, these programs attempt to help the writer process more than mere "words." Instead, they attempt to help the writer deal with the relationships between ideas, with their relative value and importance.

The Fifth Generation: (Emerging From the Vaporware). At this point, fifth-generation writing courseware is a trend rather than an available product. Fully realized fifth-generation materials will provide increasingly sophisticated author systems. (There are already, for example, word processors which alert you to a possible mispelling before you have finished typing the word.) Built-in telecommunications utilities will allow the writer to get prethinking and prewriting information from distant data bases and to obtain reader responses from a wide variety of readers-at-a-distance. Increasingly sophisticated uses of high-resolution graphics will provide writers with the ability to print materials equal in quality to commercially published work. "Multiple windows" and data stored on compact videodiscs will allow a student to read the text of a play in one portion of the computer screen, watch a performance of the play in another portion of the screen, and write notes for a paper in still another portion.

A Brief Respite

It's not difficult to experience a bit of future shock in the face of that familiar and daunting (if somewhat shopworn) adversary: "today's rapidly changing and complex world of modern technology." It's enough to give a person pause, if not a mild-to-severe case of thinker's block. It's completely understandable that people would want to withdraw from, or

halt, the information overload and the too-rapid shifting of what we writing teachers consider the tools of our trade.

This may be an appropriate time to shift our attention to the manner in which others have treated the influence of technology on human sensibilities.

Computers and Literature: Attitudes

Pamela McCorduck[9] has discussed extensively our culture's polarized attitudes on the subject of computer's and "artificial intelligence": "One [view] says that [computers] are useful, praiseworthy, and appealing; the other...says that they are fraudulent, wicked, and even...blasphemous."

For many people the construct of "artificial intelligence" is, in fact, more a reflection of real stupidity.[10]

Sherry Turkle[11] has provided a wonderfully rich perspective on the computer's capacity to evoke such diverse reactions.

> Most considerations of the computer describe it as rational, uniform, constrained by logic. I look at the computer in a different light, not in terms of its nature as an "analytic engine," but in terms of its "second nature" as an evocative object, an object that fascinates, disturbs equanimity, and precipitates thought.

Turkle has explored at some length three stages of young people's concerns with the computer: metaphysics, mastery, and identity. In the first stage, very young children concern themselves with questions about whether a computer is alive. (In paraphrase: "My computer game always beats me. It must be cheating. Only people cheat, so the computer game

must somehow be alive.")

Later, students are more concerned with gaining power over the machine, with making it do what they want. As adolescents, their interests then shift to questions of self-identity. Adolescents who interact with computers often do their "thinking" about themselves in relation to the machine. Many people used to consider animals as our nearest "relative" on the planet ("Human beings are just animals with rational minds (or a soul, or that can laugh, etc.) Now more people are beginning to use the computer as the primary referent. ("We're just computers with emotions.")

The metaphysics-mastery-identity framework is useful for prethinking and rethinking our own attitudes toward technology in general and toward the computer and artificial intelligence in particular. It is also useful as an analytic schema for examining how others have addressed these themes. Consider these few sources:

- The Bible (specifically the injunction against graven images)
- The Illiad (specifically Hephaestus, who created not only mechanical slaves, but also Pandora)
- A Connecticut Yankee in King Arthur's Court
- Pygmalion
- Faust
- R.U.R
- Frankenstein
- Hard Times
- Gulliver's Travels
- Brave New World
- 1984

Daniel Chandler[12] notes that:

> In Britain at least the legacy of literature...has been a "civil defense" strategy by English teachers to protect children from the evils of modern industrial society.... For such teachers the computer is often just another invasive influence in the classroom. It will no doubt be many years before there is any general shift in this stance.

Computers and Literature: Applications

Attitudes in the United States generally parallel those which Chandler describes. In addition, there are now, for better or worse, numerous applications for computer-assisted instruction in literature. These may be roughly categorized as follows:

Tutorials. These relatively interactive programs help students think and write about literature as they lead students through ordered sets of questions. These are usually examples of second-generations CAI/writing as described above, although some have rewriting features included.[13]

Word Processing Activities. This category refers to word processing files that contain assignments to help students do creative writing or think and write about literature. They do not have the interactive nature of the tutorials except insofar as they can be structured to carry on a dialogue of sorts with the student.[14]

Data Base Courseware. This is a relatively new application of pre-existing software (i.e., database managers) to the study of literature. In some cases, the materials provide databases for study and research

purposes.[15] In others, there is an equal emphasis on the students' building their own data bases through thinking and writing activities.[16]

Creative Writing Software. This category would include programs that allow students to create and sometimes illustrate (with computer graphics) traditional as well as interactive stories.[17] Also included would be courseware that helped students study and write poetry.[18]

Interactive Fiction. This refers to "stories" in which the particulars of story-line and occasionally plot and character development result from the choices the "reader" (who is in some sense also the writer) makes in the course of using the software. [19]

What? So What? Now What?

Up to this point, we have been immersed in a complex array of topics, concepts, categories, and crosscurrents. They constitute multiple converging determinants, shaping the nature of our students, the nature of the instructional tools available to us, and the nature of our enterprise as teachers of reading, thinking, and writing.

What real difference will this all make for us and our students? Tomorrow? Next semester? Next year?

Some people are doing what they can to insure that very little will happen. With the uncertainty of ungovernable and uncertain transitions (our "rapidly changing and complex world"), comes a predictable kind of retrenching. The editors of Educational Technology have already noted (August 1984) that "It has taken longer than usual for the critics to begin to pummel this particular innovation in the schools, but now the backlash against computers in education has begun."

We can certainly all stand to rethink our attitudes about the uses of technology in our work, and we can reassess the promise and problems of specific computer applications in the teaching of writing and in the study of literature. We can also engage in more prethinking, in making more explicit what we need to know and what we don't want to know about about computers and the teaching of English.

ONE FINAL THINKING BLOCK

When asked about the computer, many English teachers would express an attitude similar to this:

> **[It] destroys memory [and] weakens the mind, relieving it of...work that makes it strong. [It] is an inhuman thing.**

As many readers will know, this attitude is not being expressed about the computer. It's to be found in Plato, and the reference is to writing.[20] The future of literacy -- that is, the nature and proficiency of reading, thinking, and writing skills -- is as problematic now as it has been in the past, particularly so in the context of an educational medium that is as often considered a distrusted intruder as it is taken to be a helpful ally.

If anything can be predicted about computers and literacy,[21] it is that some people will oversell the technology as a positive force and that others will decry it as an abomination. Perhaps the most we can hope for is a continued reliance on talented teachers who acquire an informed

exuberance. As always, it is their prethinking, thinking, and rethinking that will be a major force in making the most of whatever the technology and their students have to offer them.

Notes and References

1. This discussion is elaborated in "Making the Implicit Explicit: Toward Confluent Computer Literacy," Teaching, Learning, Computing, Vol. 1, No. 3, 1984.
2. "The Current State of Computer Use in the Schools," in Report #6 The Write Help, A Handbook for Computers in Classrooms. Hugh Mehan and Randall Souviney (eds.), Center for Human Information Processing, University of California, San Diego, July 1984.
3. Presentation at Computer-Using Educators Conference, San Diego State University, San Diego, California, 1983. See also, "Sexism and CAI," by Stephen Marcus, Computers, Reading, and Language Arts, Vol. 1, No. 2, 1983.
4. Electronic Learning, October 1984; "Education Computer News," February 27, 1985.
5. This discussion is elaborated in "My Argument With Sheridan: Toward a Thinking Process Model," South Coast Writing Project Newsletter, Vol. 5, No. 5, 1985.
6. From a presentation by Betsy Barbour, National Association of Teachers of English, University of Durham, Durham, England, 1984.
7. From a presentation by David Dillon, National Association of Teachers of English, University of Durham, Durham, England, 1984.
8. There are many examples of the kinds of software discussed below. This discussion is elaborated, along with the names of specific software in "Computers in the Curriculum: Writing," by Stephen Marcus, Electronic Learning, October 1984. See also, "Real-Time Gadgets With Feedback: Special Effects in Computer-Assisted Writing," by Stephen Marcus. In

The Computer in Composition Instruction, Wm. Wresch (ed.), (Urbana, Ill.: National Council of Teachers of English, 1984).

9. Machines Who Think (San Francisco: W.H. Freeman and Co., 1979).

10. I'm indebted for this turn of phrase to a handout provided by Allan November at our panel on "Computers in the Curriculum (Part 2)," World Conference on Computers and Education, Norfolk, Virginia, 1985.

11. The Second Self: Computers and the Human Spirit. (New York: Simon & Schuster, 1984).

12. "Computers and Literacy." In Computers and Literacy, Daniel Chandler and Stephen Marcus (eds.). (Milton Keynes, England: Open University Press; Philadelphia: Taylor & Francis, 1985).

13. Examples are SEEN (Helen Schwartz, Department of English, Oakland University, Rochester, Michigan) and GASP (Mark Ferrer, Department of English, University of California, Santa Barbara).

14. Examples are in Vol.1: Writing Activities and Language Skill Builders for the Bank Street Writer (Scholastic, Inc.); Writing Activities For Scholastic's PFS:Write (Scholastic, Inc.), and Computer Writing Resource Kit (forthcoming from D.C. Heath).

15. For example, the Language Arts Files for the Bank Street Filer (Scholastic, Inc.).

16. For example, the Literature and Composition Activities for Scholastic's PFS:File (Scholastic, Inc).

17. Examples are Story Tree (Scholastic, Inc.), Story Maker (D.C. Heath), and The Bank Street Story Book (Mindscape).

18. For example, Compupoem (Stephen Marcus, South Coast Writing Project, University of California, Santa Barbara).

19. For example, Hitchhiker's Guide to the Galaxy (Infocom); Robots of

Dawn (Epyx); Swiss Family Robinson, Wizard of Oz, Treasure Island, Wind in the Willows, Alice in Wonderland (Windham Classics); Farenheit 451 (Trillium)

20. From an address by William Miller in an address to the Modern Language Association, New York, 1983.

21. For a list of predictions, see "The Future of Literacy," by Stephen Marcus. In Computers and Literacy, Daniel Chandler and Stephen Marcus (eds.) (Milton Keynes, England: Open University Press; Philadelphia: Taylor & Francis, 1985).